made at Blue Hill Observatory. These data are particularly valuable for such a study, since in each flight continuous records of temperature, pressure, humidity, wind-velocity and direction were obtained for all heights reached by the uppermost kite, below which the meteorograph is attached to the wire. In the kite meteorograph used, the thermometer and the hair-hygrometer are screened as much as is possible, thus rendering the heat received from radiation a negligible amount.

A total of sixty-four kite flights were found in which the meteorograph penetrated a cloud, and, since in six of these flights two cloud-sheets were encountered, the temperature conditions in seventy cloud-strata were obtained as a basis for the investigation. Of these, 63 per cent. showed a rise in temperature of 3·0° F. or more in the upper part of the cloud or immediately above it, 23 per cent. showed no apparent effect of the cloud on the temperature conditions, 7 per cent. showed an inversion below the base of the cloud, while the remaining 7 per cent. showed an isothermal condition prevailing from the base to the summit of the cloud. The flights in which the records

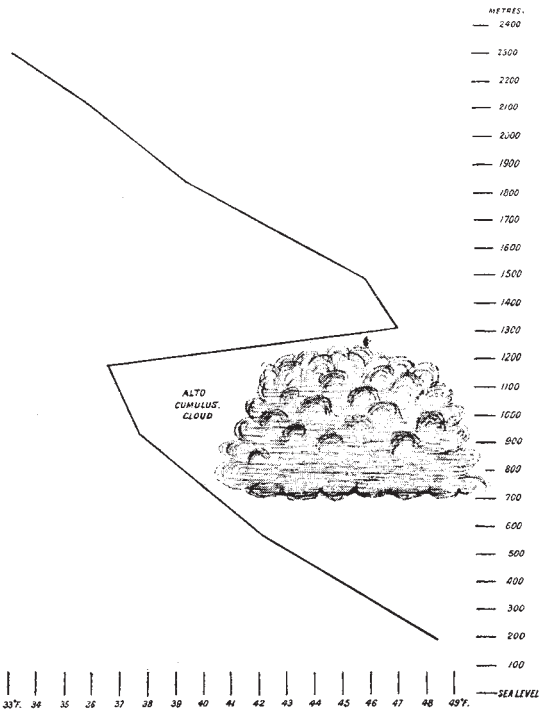

FIG. 1.—Curve of November 3, 1904, showing increase of temperature occurring within and above cloud.

were obtained were distributed with fair uniformity throughout the year, and the clouds encountered represent all kinds except cirrus and cirro-stratus, these having rarely been penetrated. Moreover, although by far the greater number of flights were made in the daytime, many flights at night are included.

In the largest of the four groups, namely, the one including the flights which showed a rise in temperature in the upper part of the cloud or immediately above it, the increase usually began about half-way between the base and the summit, and persisted until the maximum temperature for the inversion was reached a short distance above the uppermost part of the cloud. Beyond that point the usual rate of decrease, approximately the adiabatic rate for dry air, prevailed as high as the kite ascended. In the next largest group, that including flights in which the cloud had no apparent effect on the temperature conditions recorded, a fairly regular rate of decrease, somewhat similar to the adiabatic rate for saturated air, was found. In the next group, that including cases in each of which there was an inversion below the cloud, the increase in temperature persisted throughout the cloud and to various heights above it, where a decrease again began. In every one of these cases there were the characteristic cyclonic conditions of a shallow easterly wind at the ground overlaid by a warm south-west wind, with precipitation following. It is thus evident that the increase in temperature was caused by the importation of relatively warm air, and hence began at a height independent of the cloud, the latter only reinforcing the larger warming. In the smallest group, that including the five cases in which there was a practically isothermal condition throughout the cloud, the distinguishing characteristic was really that of the largest group, for, since the usual condition in the lower free air is that of a fairly uniform decrease of temperature approaching the adiabatic rate for dry air, an isothermal state is theoretically equivalent to an increase of temperature with increasing height, such as characterise the cases of the first group. If this be granted, 70 per cent. of the instances show an increase of temperature in the upper part of the cloud and beyond for a short distance.

This phenomenon of an increase of temperature is entirely independent of the difference in the adiabatic rates of dry and of saturated air, that for the latter being about one-half that of the former. The marked decrease in

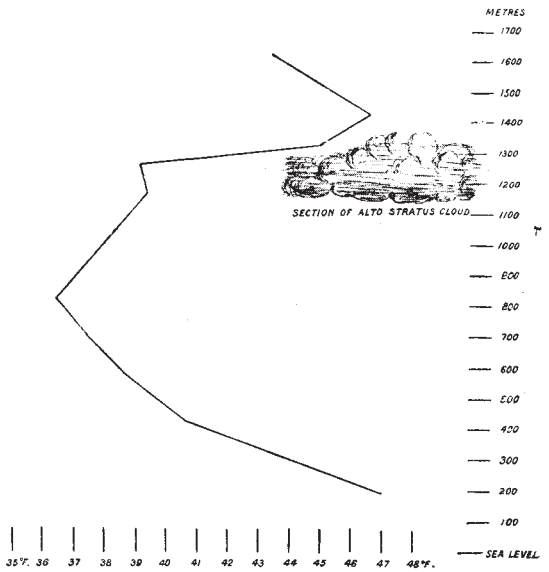

FIG. 2.—Curve of April 4, 1905, showing increase of temperature beginning below cloud.

relative humidity almost always occurring just above a cloud is probably simply the result of the increased temperature. Dr. Shaw, the director of the English Meteorological Office, in discussing the thermal relations of floating clouds, says:—"A floating cloud, a finite mass of air carrying water particles, is losing by radiation into space (at night) through the clear air above it more heat than it receives from the earth beneath; the water globules will, in consequence of this loss of heat, evaporate, and the cloud will vanish" (Quarterly Journal of the Royal Meteorological Society, vol. xxviii., 122, p. 95). It is also worthy of note that in a balloon voyage made in Germany recently, not only was there noted a "warming above the cloud, or at least above the lowest plane of formation," but an increased temperature was recorded in a stratum of ordinary haze (Elias and Field, Quarterly Journal of the Royal Meteorological Society, vol. xxxi., 134, p. 125).

ANDREW H. PALMER.

Blue Hill Observatory, Hyde Park, Mass., May 5.

Eddy Formation—A Correction.

IN Prof. Bryan's solution of the problems in eddy formation (NATURE, February 3, p. 408) no mention is made of the fact that a vortex in one plane at rest, when the method of conformal representation is used, does not in general lead to a solution in which the corresponding vortex is at rest.

Taking a single vortex at $z=z_0$ at rest, let

$$w=im\log(z-z_0).$$

Transform by putting $z=f(t)$, and let $z_0=f(t_0)$,

$$w=im\log\{f(t)-f(t_0)\}$$
$$=im\log(t-t_0)+im\log\left\{f'(t_0)+f''(t_0)\frac{t-t_0}{2}\ldots\right\}$$

expanding in the neighbourhood of $t=t_0$, and at the vortex

$$\frac{dw}{dt}=im\frac{d}{dt}\log(t-t_0)+\frac{im\,f''(t_0)}{2\,f'(t_0)},$$

the first part giving the velocity due to the vortex itself and the second the motion of the vortex. The vortex will not be at rest unless $f''(t_0)=0$.

Employing Prof. Bryan's method to obtain a solution giving a vortex at rest in the t plane in the cases considered by him, with the vortex in the z plane not necessarily at rest, we have

$$w=Uz+im\log\frac{z-a-ib}{z-a+ib}$$
$$z=f(t)$$
$$a+ib=f(t_0).$$

Then the velocity at any point is given by

$$\frac{dw}{dt}=\left\{U+\frac{im}{z-a-ib}-\frac{im}{z-a+ib}\right\}f'(t).$$

At the vortex the motion is given by

$$\frac{dw}{dt}=\left\{U-\frac{im}{2ib}+\frac{im}{2}\frac{f''(t_0)}{[f'(t_0)]^2}\right\}f'(t_0),$$

omitting the infinite term due to the vortex itself. If the vortex is at rest,

$$U-\frac{m}{2b}+\frac{im}{2}\frac{f''(t_0)}{[f'(t_0)]^2}=0 \quad . \quad . \quad . \quad . \quad (1)$$

and if the velocity at $z=0$ in the z plane vanishes,

$$U-\frac{2mb}{a^2+b^2}=0 \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

Prof. Bryan's first transformation is $z=t^n$, so the condition (1) becomes, since $t_0{}^n=a+ib$,

$$U-\frac{m}{2b}+\frac{im}{2}\frac{n-1}{n(a+ib)}=0 \quad . \quad . \quad . \quad . \quad (1)$$

If n is not unity, (1) and (2) give

$$n=\tfrac{1}{4},$$

which lies outside the prescribed limits of n. Consequently no solution of this type can be obtained giving a vortex at rest.

Prof. Bryan's second transformation is

$$Z=\sqrt{c^2+t^2}.$$

Condition (1) becomes in this case, since

$$z^2+t_0{}^2=(a+ib)^2,$$

$$U-\frac{m}{2b}+\frac{im}{2}\frac{c^2}{(a+ib)\{(a+ib)^2-c^2\}}=0 \quad . \quad . \quad (1)$$

which gives

$$a(a^2-3b^2-c^2)=0 \quad . \quad . \quad . \quad . \quad . \quad (3)$$

$$U-\frac{m}{2b}+\frac{mc^2}{2b\{3a^2-b^2-c^2\}}=0 \quad . \quad . \quad . \quad (4)$$

Equations (3), (4), and (2) cannot be satisfied by any values of a, b, and m. A solution of the two-dimensional problem of liquid impinging at right angles on a plate of finite breadth with two stationary vortices at the back of the plate and finite velocities at the edges is impossible.

E. H. HARPER.

MR. HARPER is quite right. It would appear from his investigation that it is impossible to apply the transformations in question to fluid motions with stationary vortices, notwithstanding that a vortex transforms into a vortex, and a fluid particle *other than a vortex* which is at rest transforms into a particle also at rest. It is a pity that this fact was overlooked, and that results were consequently published which are of less interest than was supposed at the time.

G. H. B.

The Nutritive Value of Black Bread.

IT appears to me that the contributor of the article on this subject in NATURE of May 5 has overlooked one all-important question, viz. how much of the nitrogen present in each form of bread is actually digested.

I had occasion to look up this question last year, as I happen to be a politician who *is* "particular about his facts," and I agree with your contributor in detesting "allegations," political or otherwise, that are "wanting in scientific accuracy." I referred, accordingly, to Wynter Blyth's "Foods: their Composition and Analysis," and found on p. 173 a table showing "the amount of dry substance, &c., absorbed in percentages of" (*a*) North German black bread (*Pumpernickel*) made of whole rye meal with leaven; (*b*) Munich rye bread, which is a mixture of rye and coarse wheat meal, with leaven; (*c*) white wheaten bread.

The percentages absorbed were:—

	Dry substance	Nitrogen
(*a*)	80·7	57·7
(*b*)	89·9	77·8
(*c*)	94·4	80·1

"It is thus shown," says Wynter Blyth, "that of the black bread a person would have to eat very much more than of white bread." I worked out the corollary of these facts in a letter published in the *Western Daily Mercury* of February 18, 1909, and showed that, on the basis of these analytical results, it would be necessary to eat 8 lb. of *Pumpernickel* to obtain the nitrogenous nutriment afforded by $5\frac{3}{4}$ lb. of wheaten bread.

My copy of Wynter Blyth's book was published in 1888, and his results are quoted from G. Meyer's experiments. It is, of course, possible that during the last twenty years Meyer's results may have been proved wrong, and that pure rye bread has been proved to yield as much *digestible* nitrogen as wheaten bread yields. Should this be the case, I shall be much obliged by information as to the latest and most trustworthy experiments.

FRANK H. PERRY-COSTE.

Polperro, Cornwall, May 16.

THE criticism is quite to the point, but is not the last word to be said on the subject. It is well known that in the digestion of whole-meal breads there is larger waste; but, on the other hand, if in the initial material there is a greater amount of certain constituents, then, in spite of a larger percentage waste, the actual quantity of these ingredients utilised in the body may be greater. In Rubner's experiments, cited in "Standardisation of Bread. Bread and Food Reform League," this was found to be the case. The percentage of nitrogen absorbed from white flour being 79·93, and that from whole meal being only 69·53, nevertheless the actual amount absorbed from equal weights of the two materials was larger in the case of the whole meal, and this was even more marked with the fat and the inorganic constituents; but at the moment I am unable to find similar analyses relating to black bread itself.

THE WRITER OF THE ARTICLE.

Native Tantalum.

SINCE the communication by Mr. P. Walther regarding native tantalum from the Ural Mountains was published in NATURE of September 16, 1909 (p. 335), another small quantity of a few dekagrams of native tantalum has been recognised in the collection of the deceased mining director, having been collected from the Altai Mountains. It was found in very similar circumstances, and at about the same time, as the tantalum from the Ural Mountains. The difference is in the impurities; the Altai tantalum contains gold from a slight trace to 0·0095 per cent., but no trace of manganese, tin, and niobium could be detected; the latter three have been found in the Ural tantalum. The average percentage of tantalum is 98–99 per cent. The average measurement of the crystals is about 0·1 mm., and the crystals are of the regular system, as in the Ural tantalum. The hardness (between 6 and 7) and the specific gravity (11·2) are the same. The specific gravity mentioned in NATURE of September 16, 1909, has been found too low, the error being due to air bubbles.

Newcastle-on-Tyne. W. VON JOHN.